**Topics: Confidence Intervals**

**Solutions**

1. For each of the following statements, indicate whether it is True/False. If false, explain why.
2. The sample size of the survey should at least be a fixed percentage of the population size in order to produce representative results.

Answer: True.The representation of the survey results should have a sample size. The sample size must be a fixed percentage of the total population size of the survey.

1. The sampling frame is a list of every item that appears in a survey sample, including those that did not respond to questions.

Answer: False. The sampling frame refers to a list of an item which responds to the question and not the ones which do not respond to the questions.

1. Larger surveys convey a more accurate impression of the population than smaller surveys.

Answer: True. The larger conveys a more accurate impression of the population as larger surveys involve large sample size which reduces the chances of error.

1. *PC Magazine* asked all of its readers to participate in a survey of their satisfaction with different brands of electronics. In the 2004 survey, which was included in an issue of the magazine that year, more than 9000 readers rated the products on a scale from 1 to 10. The magazine reported that the average rating assigned by 225 readers to a Kodak compact digital camera was 7.5. For this product, identify the following:
2. The population

Answer: p=x/n=225/9000=0.025

1. The parameter of interest

Answer: sample size,average,scale

1. The sampling frame

Answer: 9000

1. The sample size

Answer: 225

1. Answer: The sampling design
2. Answer: Any potential sources of bias or other problems with the survey or sample
3. For each of the following statements, indicate whether it is True/False. If false, explain why.
4. If the 95% confidence interval for the average purchase of customers at a department store is $50 to $110, then $100 is a plausible value for the population mean at this level of confidence.

Answer: True. we are 95% confident that an interval estimate contains μ. It means that if many samples are collected and the confidence interval computed for each, in the long run about 95% of these intervals will contain the true population parameter.

1. If the 95% confidence interval for the number of moviegoers who purchase concessions is 30% to 45%, this means that fewer than half of all moviegoers purchase concessions.

Answer: True. The 95% confidence interval for the number of moviegoers who purchase concessions is 30% to 45%, this means that fewer than half of all movie goers purchase concessions.

1. The 95% Confidence-Interval for *μ* only applies if the sample data are nearly normally distributed.

Answer: False. 95% confidence interval means that if we were to take 100 different samples and compute a 95% confidence interval for each sample, then approximately 95 of the 100 confidence intervals will contain the true mean value (μ).

1. What are the chances that ?
2. ¼
3. ½
4. ¾
5. 1

Answer: (D). E[x-bar] = µ (The expected value of the mean of a sample (x-bar) is equal to the mean of the population (µ).) The law of large numbers says that x-bar will be close to µ for large n (n is the size of the sample).

1. In January 2005, a company that monitors Internet traffic (WebSideStory) reported that its sampling revealed that the Mozilla Firefox browser launched in 2004 had grabbed a 4.6% share of the market.
2. If the sample were based on 2,000 users, could Microsoft conclude that Mozilla has a less than 5% share of the market?

Answer: Let p = population proportion share of the market by Mozilla

So, Null Hypothesis,  H0 : p ≥ 5%   
 {means that Mozilla has more than or equal to 5% share of the market}

Alternate Hypothesis,  HA : p < 5%  
 {means that Mozilla has a less than 5% share of the market}

The test statistics that will be used here is One-sample z-test for proportions;

T.S. =  ^p - p sqrt(p(1-p)/n) ~ N(0,1)

where, ^p  = sample proportion of the share of the market grabbed by Mozilla in 2004 = 4.6%

           n = sample of users = 2,000

So, z-test = 0.046-0.05/ sqrt(0.05(1-0.05)/2000) = -0.821

The value of z-test statistics is -0.821.

Since in the question we are not given with the level of significance so we assume it to be 5%. Now, at 5% level of significance the z table gives a critical value of -1.96 for left-tailed test.

Since the value of our test statistics is more than the critical value of z, so we have insufficient evidence to reject our null hypothesis as it will not fall in the rejection region.

Therefore, we conclude that Mozilla has more than or equal to 5% share of the market.

1. WebSideStory claims that its sample includes all the daily Internet users. If that’s the case, then can Microsoft conclude that Mozilla has a less than 5% share of the market?

Answer: We are given that WebSideStory claims that its sample includes all the daily Internet users. This means that the 4.6% share of the market represents the whole population.

Hence, we can conclude that Mozilla has a less than 5% share of the market.

1. A book publisher monitors the size of shipments of its textbooks to university bookstores. For a sample of texts used at various schools, the 95% confidence interval for the size of the shipment was 250 ± 45 books. Which, if any, of the following interpretations of this interval are correct?
2. All shipments are between 205 and 295 books.
3. 95% of shipments are between 205 and 295 books.
4. The procedure that produced this interval generates ranges that hold the population mean for 95% of samples.
5. If we get another sample, then we can be 95% sure that the mean of this second sample is between 205 and 295.
6. We can be 95% confident that the range 160 to 340 holds the population mean.

Answer: (A). the size of the shipment was 250 ± 45 books.

i.e. 250+45 = 295 and 250-45 = 205.

All shipments are not between 205 and 295 books. Because due to 95% confidence interval for the size of shipment not all shipments. The known statement is not correct

Which is shorter: a 95% *z*-interval or a 95% *t*-interval for *μ* if we know that  
 σ =s?

1. The z-interval is shorter
2. The t-interval is shorter
3. Both are equal
4. We cannot say

Answer: (A). The z-interval is shorter

The Z value for 95% confidence is Z=1.96.

The t value for 95% confidence is t = 2.262.

Questions 8 and 9 are based on the following: To prepare a report on the economy, analysts need to estimate the percentage of businesses that plan to hire additional employees in the next 60 days.

1. How many randomly selected employers (minimum number) must we contact in order to guarantee a margin of error of no more than 4% (at 95% confidence)?
2. 600
3. 400
4. 550
5. 1000

Answer: (A). Given: Consider the population proportion be p = 0.5, E = 0.04, from standard normal table, z = 1.96 for 95% confidence interval

To find: the sample size

Calculation:

The formula to find the sample size is:

n=|zα/2| 2xpxq/ E2

n=(1.96)2x0.5x0.5/0.04x0.04=2401x0.25=600.25~600(approx)

1. Suppose we want the above margin of error to be based on a 98% confidence level. What sample size (minimum) must we now use?
2. 1000
3. 757
4. 848
5. 543

Answer: (C) Given: Consider the population proportion be p = 0.5, E = 0.04, from standard normal table, z = 2.33 for 98% confidence interval

To find: the sample size Confidence Interval of Proportion Formula:   
  
 n=|zα/2| 2xpxq/ E2

n= (2.33)2x0.5x0.5/0.04x0.04=54289/64=848.26~848(approx)